Report #149

Red River Coal Company Benthic Macroinvertebrate Survey Fall 2013

Submitted To:

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EXECUTIVE SUMMARY

Biological Monitoring, Inc. (BMI) performed a stream survey in the South Fork Pound River Watershed for Red River Coal Company. The purpose of this survey was to conduct instream assessments as outlined in Red River's permits. Five instream monitoring stations were sampled.

The Virginia Stream Condition Index (VASCI) protocol was used for instream biological surveys. All biological sampling was performed in accordance with the Virginia Department of Game and Inland Fisheries' scientific collection permit requirements.

Samples were collected on September 5, 2013. Benthic samples were collected based on BMI's QAPP. All organisms were identified to the lowest practicable level and collapsed to the family level for VASCI calculation. The US EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers was used for sampling macroinvertebrate populations and performing habitat assessments.

The analysis of the Fall 2013 survey data yielded VASCI scores ranging from 28.32 (SFP-1) to 51.75 (SC-1). Using the Virginia Department of Environmental Quality devised scale, these stations were classified in the "Severe Stress" and "Stress" Aquatic Life Use (ALU) Tiers. The habitat assessment scores ranged from 140 (GF-1) to 150 (SC-1) falling into the "Suboptimal" category of habitat. Physicochemical and chemical analyses seem typical for mining influenced streams in the region.

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1.0 INTRODUCTION

Biological Monitoring, Inc. (BMI) performed a stream survey for Red River Coal Company in the South Fork Pound River Watershed located in Wise County, Virginia. The purpose of this survey was to conduct instream assessments in fulfillment of permit requirements. The present report provides the methods utilized and the results obtained from the September 5, 2013 sampling event.

BMI is a Tier III (VA) bio-monitoring facility as well as a National Environmental Laboratory Accreditation Program (NELAP) accredited Whole Effluent Toxicity Laboratory. BMI specializes in issues of water quality. Since 1980, BMI has been providing expertise in aquatic toxicology and risk assessment. Highly motivated and academically trained scientists at BMI work closely with clients to create practical solutions to environmental problems. BMI has maintained a commitment to the research and development of aquatic biomonitoring and toxicological concepts resulting in leading edge technologies and applications.

BMI interacts with regulatory agencies on behalf of its clients to solve specific environmental problems associated with water quality and toxicological regulations and permit compliance. With its main facilities located in Blacksburg, Virginia, BMI focuses on the development and application of procedures to create feasible solutions that balance the need for environmental protection and continued economic development.

2.0 METHODS AND MATERIALS

2.1 General

On September 5, 2013, samples were collected from several instream stations in the South Fork Pound River Watershed. Generally, instream stations were sampled for benthic macroinvertebrates as well as analytical and physicochemistry.

Grab samples were used for analytical and physicochemistry. Macroinvertebrate samples were collected following BMI's Biological Monitoring Program Quality Assurance Project Plan for Wadeable Streams and Rivers (QAPP) (BMI 2012). The Virginia Stream Condition Index (VASCI) protocol was used for this instream biological survey (Tetra Tech 2003). The US EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers (RBP) was used for sampling macroinvertebrate populations and performing habitat assessments (USEPA 1999).

Qualitative habitat assessments were conducted at each bioassessment site by trained and experienced individuals. Physicochemical monitoring was performed in the field. Chemistry samples were collected and submitted to Environmental Monitoring, Inc. for analyses. This survey was conducted in accordance with Red River's permit conditions.

2.2 Station Location

Five instream monitoring stations were specified for this project. Station location was provided by the permittee. These stations were located in Wise County, Virginia and in the South Fork Pound River Watershed. Latitude and longitude coordinates were recorded at the downstream extent of the station using a Garmin[®] Global Positioning System portable unit (GPSMAP 60 CSX). Table 1 summarizes the monitoring station

attributes. Figure 1 provides a map of the area and the location of the monitoring stations. Figure 2 presents an orthophoto of study area. Station photographs are presented as Appendix A.

 Table 1. Monitoring Station Attributes.

Station ID	Location Summary	Latitude	Longitude
SFP-1	Most upstream station	37° 03' 57.0"	82° 41' 40.6"
SFP-2	Downstream of confluence of Rat Creek and South Fork Pound River	37° 04' 45.9"	82° 39' 30.8"
SC-1	Mouth of Short Creek	37° 04 36.9"	82° 39' 29.4"
RC-1	Mouth of Rat Creek	37° 04' 36.3"	82° 39' 27.1"
GF-1	Mouth of Glady Fork	37° 05' 23.1"	82° 37' 51.4"

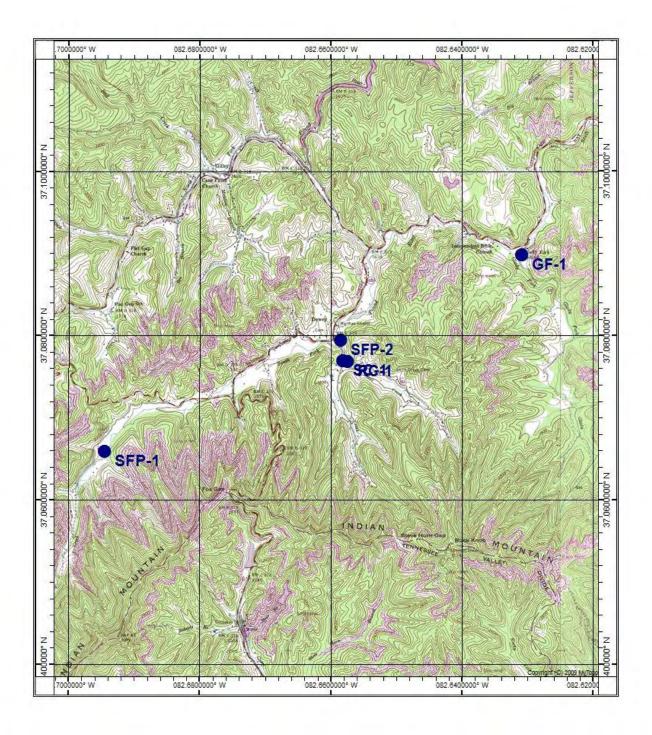


Figure 1. Map of the Monitoring Stations.

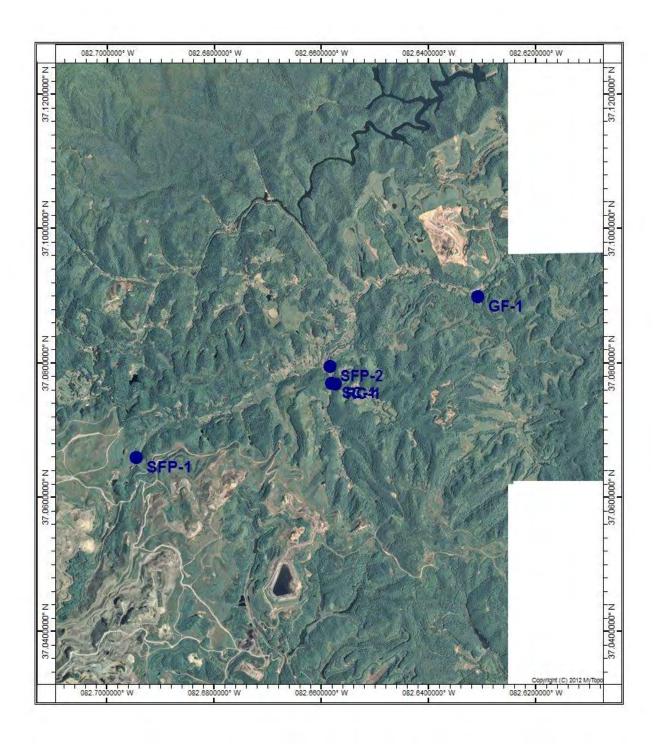


Figure 2. Orthophoto of the Study Area

2.3 Macroinvertebrate Sampling & Assessment

2.3.1 Sampling & Identification

All biological sampling was performed in accordance with the Virginia Department of Game and Inland Fisheries' scientific collection permit requirements. Macroinvertebrates were collected at each benthic station following the single habitat approach (riffle-run) as presented in the QAPP (BMI 2012). Samples were collected using a semi-quantitative approach.

Four samples were collected at each station using a 0.50 m wide rectangular kick-net having a 500 µm mesh size. Each sample was collected by first placing the net on the bottom downstream of the 0.50 m² area to be sampled. Where appropriate, large rocks and debris were brushed off into the net and removed. The area to be sampled was then vigorously kicked for approximately 30 to 90 seconds or the Best Professional Judgment of the scientist. For each monitoring station, the four samples were rinsed, composited, placed in a labeled container, and preserved in 70% ethanol. Sample information was recorded on a BMI Sample Chain of Custody Form and returned to BMI's laboratory for enumeration and identification.

Organisms were separated from the debris in the laboratory. Subsampling was performed on each sample to a standard count of $110 \pm 10\%$. All organisms were identified to the lowest practicable level. Organism identification utilized the appropriate taxonomic keys (Merritt and Cummins 2008). All data analysis was performed at the family level in order to use the Virginia Stream Condition Index (VASCI). All organisms from this study will be retained for a period of at least five years.

2.3.2 Macroinvertebrate Data Assessment

Macroinvertebrate data were analyzed using *A Stream Condition Index for Virginia Non-Coastal Streams* (Tetra Tech 2003). This VASCI was developed from an analysis of data collected by the Virginia DEQ from 1994 to 1998 and 1999 to 2002. Using these data, VASCI designated statewide reference values were determined for each of the following eight metrics of community structure:

- Total Number of Taxa measures the total number of distinct taxa and, therefore, is representative of the diversity within a sample. High diversity is a strong indicator of stream health and ability to sustain populations. This metric value is expected to decrease in response to increased perturbation.
- **Total Number of EPT Taxa** is a measure of the total number of distinct taxa within the Orders Ephemeroptera, Plecoptera, and Trichoptera. These orders include the mayflies, stoneflies, and caddis flies, respectively. Organisms in these three orders have low tolerances to perturbation. As a result, the value of the metric is expected to decrease in response to increasing perturbation.
- **Percent Ephemeroptera** is the percentage of individual Ephemeroptera (mayflies) within a sample. This metric is calculated by dividing the number of Ephemeroptera by the total number of sample organisms. This metric indicates the relative abundance of this sensitive order within the stream community. The value of this metric is expected to decrease in response to increasing perturbation.
- **Percent P T Less Hydropsychidae** is the percentage of individuals from the orders Plecoptera and Trichoptera "less" the individuals from the family Hydropsychidae. This metric is calculated by dividing the number

of organisms from the orders Plecoptera and Trichoptera (less Hydropsychidae) by the total number of sample organisms. This metric indicates the relative abundance of these sensitive orders within the stream community. The value of this metric is expected to decrease in response to increasing perturbation.

- Percent Scrapers is percent abundance of individuals in the sample whose primary functional mechanism for obtaining food is to graze on substrate or periphyton, attached algae and associated material within a sample. This metric is calculated by dividing the number of organisms from the functional feeding group "scrapers" by the total number of sample organisms. The value of this metric is expected to decrease in response to increasing perturbation.
- **Percent Chironomidae** is the percent individual organisms of the Family Chironomidae within a sample. The metric is calculated by dividing the number of Chironomidae organisms by the total number of sample organisms. Family Chironomidae, the midges, are tolerant to perturbation and their relative abundance tends to increase in impacted streams. As a result, the value of this metric is expected to increase in response to increasing perturbation.
- Percent Two Dominant Taxa is the percentage of total individuals in the two taxa with the greatest number of organisms. The metric is calculated by adding the number of organisms present in the two largest taxa. Dividing this sum by the total number of organisms yields the relative abundance of the two dominant taxa. Samples with populations concentrated into a few taxa may be an indication of impact. This metric is expected to increase in response to increasing perturbation.
- Hilsenhoff Biotic Index (HBI) was originally designed to evaluate organic pollution by utilizing tolerance values to weight taxa abundance. The

resulting HBI value is an estimation of overall pollution level. The metric is expected to increase in response to increasing perturbation.

The VASCI metrics and their expected response to perturbation are summarized in Table 2.

Table 2. VASCI Metrics and Expected Responses.

Metric	Expected Response
Total Number of Taxa	Decrease
Total Number of EPT Taxa	Decrease
Percent Ephemeroptera	Decrease
Percent PT Less Hydropsychidae	Decrease
Percent Scrapers	Decrease
Percent Chironomidae	Increase
Percent Two Dominant Taxa	Increase
Hilsenhoff Biotic Index	Increase

VASCI scores for each of the monitoring stations were calculated by dividing each station's metric values by the corresponding VASCI statewide reference values. This yielded a percentage score for each metric relative to the statewide reference condition. If the percentage score of any individual metric was greater than 100, the score was truncated to 100. The eight resulting values were then averaged to arrive at the VASCI score for each station.

2.4 Habitat Assessment

Habitat assessments were performed at each benthic station where macroinvertebrates were collected. These assessments were performed as per the RBP (USEPA 1999). Ten

habitat parameters were assessed, each receiving a score of 0 - 20. A description of each of the habitat parameters follows:

- Epifaunal Substrate / Available Cover rate the availability of structures in the stream that can be utilized as refuge, spawning, and feeding sites by macroinvertebrates. Examples of such structures would include boulders, cobble, undercut banks, roots, logs and branches. The availability of cover can be a limiting factor on stream diversity and abundance.
- Embeddedness rate the degree to which coarse substrate such as gravel; cobble and boulders are sunken into the sand, silt and mud substrate of the stream bottom. Embeddedness is the result of sediment movement and deposition. Increased embeddedness reduces the available refuge, feeding and spawning sites available to macroinvertebrates resulting in lower diversity and abundance.
- Velocity / Depth Regimes gauge the presence or absence of four velocitydepth patterns. These patterns are slow-deep, slow-shallow, fast-deep, and fast-shallow. Ideally, all four patterns should be present to best provide a stable diverse stream community.
- Sediment Deposition rates the degree to which new sediment has accumulated in pools, point bars and islands. Sediment deposition may be an indicator of an unstable environment and lowered diversity.
- Channel Flow Status rates the degree to which water fills the stream channel. Channel flow status may be affected by obstructions, diversions or widening of the stream channel. As less of the channel is filled by water, the amount of suitable substrate is also reduced.
- **Channel Alteration** rate the degree to which the shape of the stream channel has been altered. Alterations may include bridges, roads, diversion channels, channel straightening, artificial embankments, riprap,

dams, weirs, and other instream structures. Channel alteration often results in scouring and loss of available habitat.

- Frequency of Riffles (or Bends) rates the presence of quality riffle or sinuous habitat. Riffles and sinuous streams provide quality habitat for stable, diverse communities.
- Bank Stability indicates the degree to which banks have eroded or may erode. Eroded banks are a sign of sediment movement and deposition, which leads to reduced epifaunal habitat. Unstable banks may also point to poor vegetative cover.
- Bank Vegetative Protection gauges the extent of vegetative protection at the stream bank and the nearby riparian zone. Bank vegetation plays a vital role in erosion control, nutrient uptake, stream shading, and food supply.
- Riparian Vegetative Zone Width measures the extent of natural vegetation from the stream through the riparian zone. Wide vegetative zones provide pollution buffering, erosion control, habitat, nutrient uptake and nutrient input. These beneficial contributions can be impaired by commercial and residential development, roads, pastures, actively worked fields, etc.

Table 3 identifies each of the ten Habitat Assessment Parameters and their range of scores. Scores for each parameter were recorded on Habitat Assessment Field Log Sheets (USEPA 1999). The habitat assessment score for each station was calculated by adding the score for each parameter yielding a station total. The highest attainable score was 200. The actual habitat assessment process involves rating the ten parameters as optimal (>153), suboptimal (101-153), marginal (46-100), or poor (<45).

 Table 3. Habitat Assessment Parameters

Parameter	Description	Scoring
1	Epifaunal Substrate / Available Cover	0-20
2	Embeddedness	0-20
3	Velocity / Depth Regime	0-20
4	Sediment Deposition	0-20
5	Channel Flow Status	0-20
6	Channel Alteration	0-20
7	Frequency of Riffles or Bends	0-20
8	Bank Stability	Left 0-10
o	Bank Stability	Right 0-10
9	Vegetative Protection	Left 0-10
9	vegetative riotection	Right 0-10
10	Dinarian Vagatativa Zana Width	Left 0-10
10	Riparian Vegetative Zone Width	Right 0-10

2.5 Physicochemical Assessment

Conductivity (μ S), Dissolved Oxygen (mg/L), pH (SU) and temperature (°C) were recorded at each of the sample stations using calibrated field meters. Field meters included an Oakton PCTestr 35 combination pH/EC/TDS/Temperature Meter and a Hanna model HI 9142 Dissolved Oxygen Meter. Discharge was measured using the cross sectional area * velocity method. Velocity and depth were measured using a Global Flow Probe 101.

2.6 Chemical Monitoring

Samples for analytical chemistry were collected by BMI and analyzed by Environmental Monitoring, Inc.

3.0 RESULTS

3.1 Station Location

Station attributes, including latitudes and longitudes are presented in Table 1 and depicted in Figures 1 and 2. Station photographs are presented in Appendix A. Flow was adequate for sampling at all stations.

3.2 Macroinvertebrate Monitoring Data

3.2.1 Virginia Stream Condition Index Metrics

The $110 \pm 10\%$ subsamples are summarized in Table 4. The VASCI metric values for the monitoring stations sampled are summarized in Table 5. Raw data are presented in Appendix B.

Table 4. Identification / Enumeration Data

Order	Family	SFP2	SFP1	SC1	RC1	GF1
Coleoptera						
	Curculionidae	1				
	Elmidae	1		1	1	
	Psephenidae				1	
Diptera						
	Ceratopogonidae		1	1		
	Chironomidae	14	40	11	7	2
	Empididae	7	2	2		2
	Simuliidae		45	3	11	4
	Tipulidae	1	1	17	23	1
Ephemeroptera						
	Ephemerellidae			1		
	Heptageniidae			9		
Lepidoptera						
	Noctuidae				1	
Megoloptera						
	Corydalidae					1
Odonata						
	Calopterygidae				1	
Plecoptera						
	Leuctridae	4		8	3	47
	Perlidae					2
Trichoptera						
	Hydropsychidae	65	13	32	52	44
	Philopotamidae			3	1	
Other Taxa						
	Asellidae			5		
	Cambaridae	1		4	1	3
	Collembola					
	Oligochaeta	11	10	5		4
	Physidae		7			
	Planorbidae		1			
	Total	105	120	102	102	110

Table 5. VASCI Metrics.

	SFP-2	SFP-1	SC-1	RC-1	GF-1
Total Taxa	9	9	14	11	10
EPT Taxa	2	1	5	3	3
%Ephemeroptera	0	0	9.80	0	0
%Plec+Tric less Hydropsych.	3.81	0	10.78	3.92	44.55
%Scrapers	0.95	6.67	9.80	0	0
%Chironomidae	13.33	33.33	10.78	6.86	1.82
% Top 2 Dominant	75.24	70.83	48.04	73.53	82.73
HBI (Family)	5.91	6.27	4.88	5.00	3.35

3.2.2 Virginia Stream Condition Index Scores

Table 6 presents a summary of the VASCI scoring. Raw data are presented in Appendix B. Each metric score represents a percentage of the statewide reference condition. The VASCI scores calculated ranged from 28.32 (SFP-1) to 51.75 (SC-1).

Table 6. VASCI Scoring.

	SFP-2	SFP-1	SC-1	RC-1	GF-1
Total Taxa	40.91	40.91	63.64	50.00	45.45
EPT Taxa	18.18	9.09	45.45	27.27	27.27
%Ephemeroptera	0	0	15.99	0	0
%Plec+Tric less Hydropsych.	10.7	0	30.29	11.02	100
%Scrapers	1.85	12.92	19.00	0	0
%Chironomidae	86.67	66.67	89.22	93.14	98.18
% Top 2 Dominant	35.78	42.15	75.09	38.25	24.96
HBI (Family)	60.15	54.85	75.29	73.53	97.79
VASCI	31.78	28.32	51.75	36.65	49.21

Figure 3 is a graphical representation of the VASCI score(s) along with the Aquatic Life Use Tiers. It should be noted that four tiers exist in the VASCI, whereas, a score of 60 or higher is considered "unimpaired" and a score of < 60 is considered "impaired".

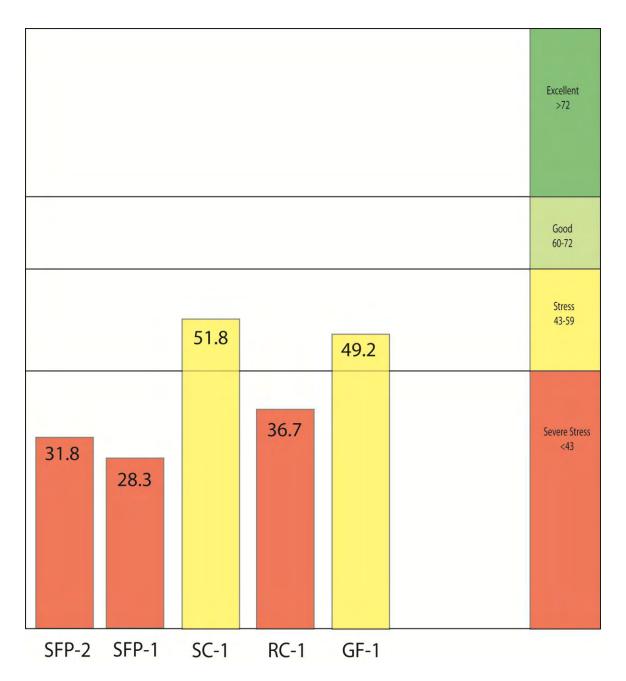


Figure 3. VASCI Scoring Summary

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3.3 Habitat Assessment

Table 7 presents a summary of the habitat assessment score for the monitoring stations. Raw data are presented in Appendix B. The habitat assessment scores ranged from 140 (GF-1) to 150 (SC-1) falling into the "Suboptimal" category of habitat.

Table 7. RBP Habitat Scoring.

Parameter	SFP-2	SFP-1	SC-1	RC-1	GF-1
Subst./Cover	18	16	17	17	16
Embeddedness	11	2	14	11	10
Velocity	16	18	14	15	15
Sediment Dep.	13	12	11	14	11
Channel Flow	20	19	16	18	11
Channel Alt.	14	14	15	13	14
Freq of Riffles	19	19	19	19	17
Bank Stab L	9	9	10	8	9
Bank Stab R	9	9	9	9	9
Veg. Prot. L	9	7	9	8	10
Veg. Prot. R	7	10	10	6	9
Rip. Zone L	2	2	0	9	8
Rip. Zone R	0	10	6	0	1
Total	147	147	150	147	140

Figure 4 is a visual representation of the habitat score(s) obtained for this permit along with the different tiers.

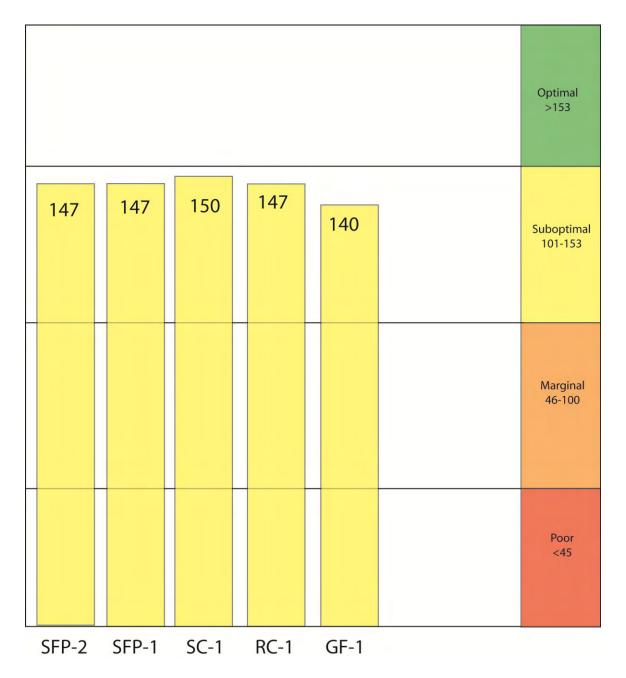


Figure 4. Habitat Scoring Sumary

3.4 Physicochemical Assessment

Table 8 presents the physicochemical assessments.

Table 8. Water Quality Analyses.

	SFP-2	SFP-1	SC-1	RC-1	GF-1
Conductivity (µS/cm)	2060	2070	385	1554	654
Dissolved Oxygen (mg/L)	8.31	7.42	8.19	8.23	8.35
pH (SU)	7.85	7.27	7.65	7.61	7.67
Temperature (°C)	17.5	16.8	18.7	18.8	17.6
Flow (cfs)	22.29	20.31	0.32	0.93	0.66

3.5 Chemical Monitoring

Results from the chemical monitoring are not included in this report. Results will be provided by Environmental Monitoring, Inc. separately.

4.0 DISCUSSION

Water quality and both instream and riparian habitat are important determinants of the composition, structure, and function of biotic communities. The instream water quality assessments and the RBP Habitat Assessment techniques used in this study do not provide adequate discriminatory power to differentiate cause and effect. A systematic assessment of instream and riparian habitat quality is necessary to fully assess water quality conditions in streams and rivers (USEPA 1999).

4.1 Station Location

Since the sampling locations were presumably specified in the permit, it is assumed that they are representative of the permit in question. Furthermore, this study represents a significant component of the holistic watershed management approach cited in DMLR Guidance Memorandum 32-10 Revised (DMLR 2011).

4.2 Macroinvertebrate Data

The VASCI values in this study should be considered a relative ranking, indicating the comparability of the studied stream to the statewide reference for least disturbed streams. As such, these values should not be considered an absolute rating.

The VASCI validation document recommends Aquatic Life Use tiers based on the VASCI scores (VADEQ 2006). These tiers and their respective scores are as follows:

- > "Severe Stress indicates scores below 43;
- > "Stress" indicates scores from 43 to 59;
- > "Good" conditions indicate scores from 60 to 72; and
- ➤ "Excellent" stream quality is represented by scores above 72.

The VASCI scores calculated for this permit ranged from 28.32 (SFP-1) to 51.75 (SC-1). These scores fall into the "Severe Stress" and "Stress" Aquatic Life Use tiers.

4.3 Habitat Assessment

Habitat plays an important role in species composition, various assemblages and numbers of organisms found in aquatic environments. To make meaningful impact analyses, one must consider habitat data as a possible limiting factor. The habitat assessment scores ranged from 140 (GF-1) to 150 (SC-1) falling into the "Suboptimal" category of habitat.

RBP habitat assessment techniques are qualitative in nature and designed to determine comparability and ranking amongst stations. Traditionally, this approach assumes the presence of a reference station for the data set. To further explore the role habitat may be playing on the benthic score; additional data will have to be collected.

4.4 Water Quality Assessment

The water chemistry parameters examined, conductivity, pH, temperature and flow, were typical for streams influenced by urban environments and mining in the region.

5.0 LITERATURE CITED

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APPENDIX A: STATION PHOTOGRAPHS

SFP-2



SFP-1



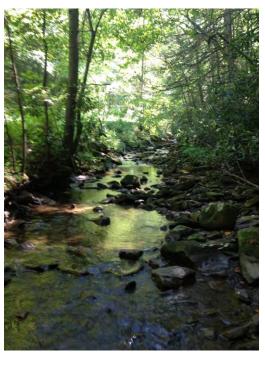
SC-1



RC-1

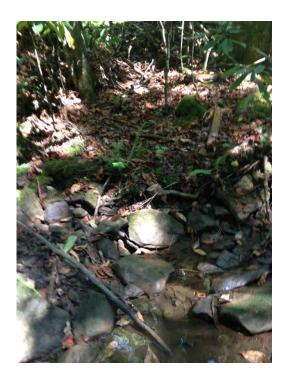


GF-1









APPENDIX B:

RAW DATA

BIOLOGICAL MONITORING, INC. 1800 KRAFT DRIVE SUITE 104 BLACKSBURG VIRGINIA 24060

PH: 540-953-2821 FAX: 540-951-1481 WWW.BIOMON.COM



NELAC ACCREDITED LAB # 460015

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

STREAM NAME South Fork Pound	LOCATION				
STATION # SFP RIVERMILE	STREAM CLASS				
LATLONG	RIVER BASIN				
STORET #	AGENCY				
INVESTIGATORS JR , WB					
FORM COMPLETED BY	DATE 9-5-13 TIME 1415 AM PM	REASON FOR SURVEY			
WEATHER Now	Past 24	Has there been a heavy rain in the last 7 days?			

WEATHER CONDITIONS	Now Past 24 hours Storm (heavy rain) rain (steady rain) showers (intermittent) % cloud cover clear/sunny Past 24 hours Yes No Air Temperature Other Other
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)
	Pics: 186-191
	2C 5.33 1.04 2.35 13.02 C 5.33 0.80 1.45 6.18 LC 5.33 0.40 1.75 3.09 72.79 CF5
	C 5.33 0.80 1.45 6.18
	LC 5.33 0.40 1.75 3.09 22.29 CFS
	Width: 16 ft PH 7.85
	DO 8.31 cond 2060 temp 17.5
	temp 17.5
STREAM CHARACTERIZATION	Stream Subsystem Perennial Intermittent Tidal Stream Origin Glacial Non-glacial montane Swamp and bog Stream Type Coldwater Catchment Area km² Catchment Area

+2 crayfish

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse Forest • Commercial Field/Pasture • Industrial Agricultural • Other Residential	Local Watershed NPS Pollution No evidence Some potential sources byious sources Local Watershed Erosion None Moderate Heavy					
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present Trees Shrubs Herbaceous dominant species present						
INSTREAM FEATURES	Estimated Reach Length Estimated Stream Width Sampling Reach Area Area in km² (m²x1000) Estimated Stream Depth Surface Velocity (at thalweg)	Canopy Cover Partly open Partly shade High Water Mark Proportion of Reach Represented by Stream Morphology Types Riffle \$6 % Run 40 % Pool 60 % Channelized Yes No No					
LARGE WOODY DEBRIS	LWDm² Density of LWDm²/km² (LWD/ re	ach area)					
AQUATIC VEGETATION	Indicate the dominant type and record the dom • Rooted emergent • Floating Algae dominant species present Portion of the reach with aquatic vegetation	Rooted floating Free floating					
WATER QUALITY	Temperature ° C Specific Conductance Dissolved Oxygen pH Turbidity WQ Instrument Used	Water Odors Normal/None • Sewage • Petroleum • Chemical • Fishy • Other					
SEDIMENT/ SUBSTRATE	Odors Normal Chemical Other Oils Absent Sewage Petroleum None None Profuse	Deposits Sludge Sawdust Other Cother Cother Sand Looking at stones which are not deeply embedded, are the undersides black in color?					

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		0	Detritus	sticks, wood, coarse plant	5
Boulder	> 256 mm (10")	10		materials (CPOM)	
Cobble	64-256 mm (2.5"-10")	45	Muck-Mud	black, very fine organic	0
Gravel	2-64 mm (0.1"-2.5")	30		(FPOM)	
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)	0			

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NELAC ACCREDITED LAB # 460015

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME South Forle Pound	LOCATION		
STATION #_SFP RIVERMILE	STREAM CLASS		
LATLONG	RIVER BASIN		
STORET #	AGENCY		
INVESTIGATORS JR, WB			
FORM COMPLETED BY WB	DATE 9-5-13 TIME 1415 AM PM	REASON FOR SURVEY	

Habitat	Condition Category					
Parameter	Optimal	Suboptimal	Marginal	Poor		
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
SCORE	20 19 (18)17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50- 75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are mor than 75% surrounded by fine sediment.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.		
SCORE	20 19 18 17 16	15 14 (13 12 11	10 9 8 7 6	5 4 3 2 1 0		
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		



Habitat		Conditio	n Category		
Parameter	Optimal	Suboptimal	Marginal	Poor	
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern. Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.		Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabio or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water of shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
SCORE(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
9. Vegetative Protection (score each bank)			50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one- half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by yegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE(LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0	
SCORE (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <0 meters: little or no riparian vegetation due to human activities.	
SCORE(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0	

LDB Road RDB form

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STREAM NAME South Fork Pound LOCATION

STATION # 550 RIVERMILE_

NELAC ACCREDITED LAB # 460015

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

STREAM CLASS

LATLC	ONG	RIVER BASIN
STORET #		AGENCY
INVESTIGATORS JR	SWG	
FORM COMPLETED BY	WB	DATE 9-5-13 TIME 1640 AM PM REASON FOR SURVEY
WEATHER CONDITIONS	• rain (• shower %• %c	Past 24 hours 'Yes No in (heavy rain) is (steady rain) rs (intermittent) cloud cover elear/sunny Past 24 hours 'Yes No Air Temperature 23 ° C Other
SITE LOCATION/MAP	Pics: RC 3.5 C 3.5 LC 3.5	ite and indicate the areas sampled (or attach a photograph) $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
STREAM CHARACTERIZATION	Stream Subsystem Perennial Into Stream Origin Glacial Non-glacial montant Swamp and bog	termittent • Tidal • Coldwater • Warmwater • Spring-fed • Mixture of origins • Other

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PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse • Forest • Field/Pasture • Agricultural • Residential	Local Watershed NPS Pollution No evidence Some potential sources Obvious sources Local Watershed Erosion None Moderate Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dom trees dominant species present	• Grasses • Herbaceous
INSTREAM FEATURES	Estimated Reach Length Estimated Stream Width Sampling Reach Area Area in km² (m²x1000) Estimated Stream Depth Surface Velocity (at thalweg) MOO m m² km² p² km² o 3 m surface Velocity (at thalweg)	Canopy Cover Partly open Partly shaded • Shaded High Water Mark Proportion of Reach Represented by Stream Morphology Types Riffle 50 % • Run 30 % Pool 20 % Channelized • Yes • No Dam Present • Yes • No
LARGE WOODY DEBRIS	LWDm² Density of LWDm²/km² (LWD/ re:	ach area)
AQUATIC VEGETATION	Indicate the dominant type and record the dom • Rooted emergent • Floating Algae dominant species present Portion of the reach with aquatic vegetation 8	Rooted floating Free floating
WATER QUALITY	Temperature O C Specific Conductance Dissolved Oxygen pH Turbidity WQ Instrument Used	Water Odors Normal/None • Sewage Petroleum Fishy Other Surface Other Water Surface Oils Slick • Sheen • Globs • Flecks None • Other Turbidity (if not measured) Clear • Slightly turbid • Turbid Opaque • Stained • Other
SEDIMENT/ SUBSTRATE	Odors Normal Chemical Anaerobic None Other Sufface Other Sufface Other Sufface Other Sufface Other Sufface Other Sufface None Other Other Sufface Other Sufface Other Other Sufface Other Oth	Deposits Sludge Sawdust Paper fiber Sand Relict shells Other Looking at stones which are not deeply embedded, are the undersides black in color? Yes No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)		ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)			
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		10 15	Detritus	sticks, wood, coarse plant	170
Boulder	> 256 mm (10")	5		materials (CPOM)	
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	40		(FPOM)	
Sand	0.06-2mm (gritty)	Ю	Marl grey, shell fragments		
Silt	0.004-0.06 mm	10			0
Clay	< 0.004 mm (slick)	0			

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NELAC ACCREDITED LAB # 460015

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION		
STATION# SFP 2 RIVERMILE	STREAM CLASS		
LATLONG	RIVER BASIN		
STORET#	AGENCY		
INVESTIGATORS JR, WB			
FORM COMPLETED BY WB	DATE 9-5-13 TIME 1646 AM PM	REASON FOR SURVEY	

Habitat	Habitat Condit			tion Category			
Parameter	Optimal	Suboptimal	Marginal	Poor			
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.			
SCORE	20 19 18 17 (16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	lder particles are 0- 6 surrounded by fine iment. Layering of ble provides diversity boulder particles are 25- 50% surrounded by fine sediment.		Gravel, cobble, and boulder particles are mo than 75% surrounded by fine sediment.			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 (
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity depth regime (usually slow-deep).			
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due substantial sediment deposition.			
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed. Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.		Very little water in channel and mostly present as standing pools			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (

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Habitat		Condition	on Category			
Parameter	Optimal	Suboptimal	Marginal	Poor		
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	ization or Some channelization g absent or present, usually in areas of bridge abutments;		Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	osion or bank failure osent or minimal; little otential for future oblems. <5% of bank in reach has areas of erosion.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
SCORE(LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
SCORE(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes, vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one- half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
SCORE(LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0		
SCORE(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.		
SCORE(LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0		
	/ //					

Total Score _____

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NELAC ACCREDITED LAB # 460015

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

STREAM NAME S	nort Creek	LOCATION	
STATION # 501	RIVERMILE	STREAM CLASS	
LAT	LONG	_ RIVER BASIN	
STORET#		AGENCY	
INVESTIGATORS	IR, WB		
FORM COMPLETED E	WB	DATE 9-5-13 TIME 1500 AM PM	REASON FOR SURVEY

WEATHER CONDITIONS	Now storm (heavy r rain (steady re showers (interm clear/sunny	nin) • ittent) •%	Has there been a heavy rain in the last 7 days? • Yes • No Air Temperature 24 ° C Other
SITE LOCATION/MAP	Pics 192 -		oled (or attach a photograph)
	RC 147 0.1	5 0.46	0.10
	C 1,67 0.0	25 0.33	0.14
	LC 1,47 0.	10 0.50	- 20 CFS
	width: 5		PH 7.65 DO 8.19
			Cond 385 temp 18.7
TREAM CHARACTERIZATION	Stream Subsystem Perennial • Intermittent Stream Origin • Glacial • Non-glacial montane	Tidal ipring-fed dixture of origins	Stream Type Coldwater Warmwater Catchment Areakm²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse Forest Field/Pasture Agricultural Residential Predominant Surrounding Landuse Commercial Industrial Other	Local Watershed NPS Pollution • No evidence • Some potential sources • Obvious sources - Local Watershed Erosion • None • Moderate • Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dom brees dominant species present	
INSTREAM FEATURES	Estimated Reach Length Estimated Stream Width Sampling Reach Area Area in km² (m²x1000) Estimated Stream Depth Surface Velocity (at thalweg) Moderate Middle	Canopy Cover Parly shaded • Shaded High Water Mark Proportion of Reach Represented by Stream Morphology Types Riffle 65 % • Run 10 % Pool 25 % Channelized • Yes • No Dam Present • Yes • No
LARGE WOODY DEBRIS	LWDm² Density of LWDm²/km² (LWD/ re-	ach area)
AQUATIC VEGETATION	Indicate the dominant type and record the dom Rooted emergent Floating Algae dominant species present Portion of the reach with aquatic vegetation	Rooted floating Free floating
WATER QUALITY	Temperature O C Specific Conductance Dissolved Oxygen pH Turbidity WQ Instrument Used	Water Odors Normal/None · Sewage Petroleum · Chemical Fishy · Other Water Surface Oils Slick · Sheen · Globs · Flecks None · Other Turbidity (if not measured) Clear · Slightly turbid · Turbid Opaque · Stained · Other
SEDIMENT/ SUBSTRATE	Odors Normal • Sewage • Petroleum • Chemical • Anaerobic • None Oils • Slight • Moderate • Profuse	Donosito

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)		ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)				
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area	
Bedrock		Ò	Detritus	sticks, wood, coarse plant	25	
Boulder	> 256 mm (10")	30		materials (CPOM)		
Cobble	64-256 mm (2.5"-10")	40	Muck-Mud	black, very fine organic		
Gravel	2-64 mm (0.1"-2.5")	70		(FPOM)	0	
Sand	0.06-2mm (gritty)	5	Marl	Marl grey, shell fragments		
Silt	0.004-0.06 mm	5			0	
Clay	< 0.004 mm (slick)	0				

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NELAC ACCREDITED LAB # 460015

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAMNAME Short Creek	LOCATION		
STATION # SC \ RIVERMILE_	STREAM CLASS		
LATLONG	RIVER BASIN		
STORET#	AGENCY		
INVESTIGATORS JR, WB			
FORM COMPLETED BY WB	DATE 9-5-13 TIME 1500 AM PM	REASON FOR SURVEY	

	Habitat		Condition	1 Category	
	Parameter	Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
sampling reach	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50- 75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
ed II	SCORE	20 19 18 17 16	15 (14)13 12 11	10 9 8 7 6	5 4 3 2 1 0
rarameters to be evaluated in sampling reach	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast- shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
La La	SCORE	20 19 18 17 16	15 (14)13 12 11	10 9 8 7 6	5 4 3 2 1 0
Pa	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently, pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12(11)	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Habitat	Condition Category					
Parameter	Optimal	Suboptimal	Marginal	Poor		
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabio or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstration is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water of shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
SCORE(LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0		
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented, disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one- half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
SCORE(LB)	Left Bank (10) (9)	8 7 6	5 4 3	2 1 0		
SCORE (RB)	Right Bank 10	8 7 6	5 4 3	2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.		
SCORE(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)		
SCORE(RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0		

LDB Road

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Rat Craek

STREAM NAME

Stream Origin
Glacial
Non-glacial m

Glacial Non-glacial montane Swamp and bog

STATION # RC1 RIVERMILE

NELAC ACCREDITED LAB # 460015

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

LOCATION

STREAM CLASS

LATLONG		RIVER BASIN				
STORET #			AGENCY			
, WB			*-			
WB	DATE 9-5-13 TIME 1550	AM PM REA	ASON FOR SURVEY			
rain (shower	(heavy rain) (steady rain) s (intermittent) loud cover	urs · Yes	erre been a heavy rain in the last 7 days? one of the last 7 days? one of the last 7 days?			
Pics:	D 0.32 0.45 0.48	V 0,47 0,39	0.30			
	Now Storm rain (shower — % classes) Pics C C C C C C C C C C C C C	Now Parin (steady rain) Showers (intermittent) Showers (intermittent) Color of the site and indicate the are Pics 198-203 L D RC Z D,32 C D ATE 9-5-13 TIME 1550 Parin (steady rain) Showers (intermittent) Color of the site and indicate the are Pics 198-203 L D RC Z D,32	Now Past 24 hours Yes			

Spring-fed
Mixture of origins
Other____

Catchment Area

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERS FEATUR		• Fores	Pasture • Industricultural • Other	ercial rial	Local Watershed NPS • No evidence • Son • Obvious sources Local Watershed Eros • None • Moderate	ne potential sources	
RIPARIA VEGETA (18 meter	ATION		e the dominant type an	d record the d hrubs	lominant species present • Grasses • H	erbaceous	
INSTREA FEATUR		Estima Sampli Area in Estima	ted Stream Depth O	.5_m m² km²	Canopy Cover Partly open Partly open Partly open Partly open Proportion of Reach F Morphology Types Riffle 30 % Pool 40 % Channelized • Yes Dam Present • Yes	O. 1 m Represented by Stream Run 30 % • No	RDB Road
LARGE V DEBRIS	WOODY	LWD Density	of LWD	m²/km² (LWD/	reach area)		
AQUATI VEGETA		Roote Floati domina	e the dominant type and demergent Ralgae Ral	tached Algae		Free floating	
WATER	QUALITY	Specific Dissolve pH Turbidi	cature° C Conductance ed Oxygen ty trument Used			Chemical Other Globs • Flecks	
SEDIMEN SUBSTRA		Odors Norm Chem Other	ical • Anaerobic	Petroleum None Profu	Relict shells Looking at stones which are the undersides black	Paper fiber Sand Other Si H h are not deeply embedded, ek in color?	
INC	ORGANIC SUBS				ORGANIC SUBSTRATE C (does not necessarily add		
Substrate Type	Diamete	r	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area	
Bedrock			0	Detritus	sticks, wood, coarse plant	5-10	
Boulder	> 256 mm (10")		30		materials (CPOM)	5-10	
Cobble	64-256 mm (2.5'	-10")	30	Muck-Mud	black, very fine organic (FPOM)	0	
Gravel	2-64 mm (0.1"-2	.5")	25		(LIOW)	0	

10

5

0

Sand

Silt

Clay

0.06-2mm (gritty)

< 0.004 mm (slick)

0.004-0.06 mm

Marl

grey, shell fragments

0

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NELAC ACCREDITED LAB # 460015

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION		
STATION # RC 1 RIVERMILE	STREAM CLASS		
LATLONG	RIVER BASIN		
STORET #	AGENCY		
INVESTIGATORS JR, WB			
FORM COMPLETED BY	DATE 9-5-13 TIME 1550 AM PM	REASON FOR SURVEY	

Habitat	Condition Category						
Parameter	Optimal	Suboptimal	Marginal	Poor			
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.			
SCORE	20 19 18 (17)16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25- 50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50- 75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast- shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			

Habitat	Condition Category					
Parameter	Optimal	Suboptimal	Marginal	Poor		
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabic or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
SCORE(LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0		
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one- half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
SCORE(LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0		
SCORE (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone < meters: little or no riparian vegetation due to human activities.		
SCORE (LB)	Left Bank 10 (9')	8 7 6	5 4 3	2 1 0		
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0		

RDB Road

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NELAC ACCREDITED LAB # 460015

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

STREAM NAME Glady Fork	LOCATION		
STATION # GF 1 RIVERMILE	_ STREAM CLASS		
LATLONG	RIVER BASIN		
STORET#	AGENCY		
INVESTIGATORS IR, WB			
FORM COMPLETED BY WB	DATE 9-5-13 TIME 1315 AM PM	REASON FOR SURVEY	

48 crayfish

Now storm (heavy rain) rain (steady rain) showers (intermittent) % cloud cover clear/sunny Past 24 hours Yes No Air Temperature 24 ° C Other Other
Draw a map of the site and indicate the areas sampled (or attach a photograph) Pigs 180 - 185
C 2.67 0.4 0 0
C 267 0.3 0.42 0.34 LC 267 0.2 0.59 0.32 pH 7.67 0.6665 DO 8.35
Curoth = 8ft cond 654 temp 17.6°C
Stream Subsystem Y Perennial • Intermittent • Tidal • Coldwater • Warmwater

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse Forest Field/Pasture Agricultural Residential	Local Watershed NPS Pollution No evidence Some potential sources Obvious sources Local Watershed Erosion None Moderate Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dom Trees dominant species present	• Grasses • Herbaceous
INSTREAM FEATURES	Estimated Reach Length Estimated Stream Width Sampling Reach Aream² Area in km² (m²x1000)km² Estimated Stream Depthm/sec (at thalweg)m/sec	Canopy Cover Partly open Partly shaded High Water Mark O. 1 m Proportion of Reach Represented by Stream Morphology Types Riffle % Run 40 % Pool 20 % Channelized Yes No RDB Road Dam Present Yes No
LARGE WOODY DEBRIS	LWDm² Density of LWDm²/km² (LWD/ re	ach area)
AQUATIC VEGETATION	Indicate the dominant type and record the dom Rooted emergent Floating Algae dominant species present Portion of the reach with aquatic vegetation	Rooted floating Free floating
WATER QUALITY	Temperature O C Specific Conductance Dissolved Oxygen pH Turbidity WQ Instrument Used	Water Odors Normal/Nobe • Sewage • Petroleum • Chemical • Fishy • Other Water Surface Oils • Slick • Sheen • Globs • Flecks • None • Other Turbidity (if not measured) • Clear • Slightly turbid • Turbid • Opaque • Stained • Other
SEDIMENT/ SUBSTRATE	Odors Normal Chemical Other Absent Slight Moderate Petroleum None None Petroleum None Profuse	Deposits Sludge Sawdust Other Sint Looking at stones which are not deeply embedded, are the undersides black in color? Yes No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		0	Detritus	sticks, wood, coarse plant	5
Boulder	> 256 mm (10")	10		materials (CPOM)	
Cobble	64-256 mm (2.5"-10")	40	Muck-Mud	black, very fine organic	
Gravel	2-64 mm (0.1"-2.5")	20		(FPOM)	
Sand 0.06-2mm (gritty) Silt 0.004-0.06 mm		15	Marl	grey, shell fragments	
		15			
Clay	< 0.004 mm (slick)	0			

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NELAC ACCREDITED LAB # 460015

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION		
STATION #_ 6F1 RIVERMILE_	STREAM CLASS		
LAT LONG	RIVER BASIN		
STORET#	AGENCY		
INVESTIGATORS			
FORM COMPLETED BY	DATE 9-5-13 TIME 13.15 AM PM	REASON FOR SURVEY	

Habitat		Condition	Category	
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 (11	10 9 8 7 6	5 4 3 2 1 0

Habitat		Condition	n Category	
Parameter	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present,	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabio or cement, over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent, distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water of shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE(LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE(RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one- half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE(LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <0 meters: little or no riparian vegetation due to human activities.
SCORE(LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

RDB Road

0 0

Total Score _____

0 0 0 0

Order	Family	FFG	Tolerance Value	SFP2	Ē	SFP1	IB HB	GF1	HBI	SC1	HBI	RC1	HB.
e radoro	Carabidae	PR	0		c		c		c		c		C
	Chrysomelidae	ПЗ	, u		> 0		0 (0		0		0
	Curonlicaido	110	n (0		0		0		0		0
	Curcuionidae	HS	n	+	S		0		0		0		0
	Dryopidae	SH	n		0		0		0		0		0
	Dytiscidae	PR	9		0		0		0		0		0
	Elmidae	SC	4	П	4		0		0	1	4	-	4
	Gyrinidae	PR	w		0		0			ı		1	
	Haliplidae	SH	7		0		0) C		0 0		0 0
	Hydraenidae	PR	v		0		0		o C		0 0		o c
	Hydrophilidae	PR	w		0		0		0		0 0		0 0
	Lampyridae		0		0		0		0		0		0 0
	Noteridae	PR	22		0		0		0		0		0 0
	Psephenidae	SC	4		0		0		0		0	Ţ	4
	Ptilodactylidae	SH	0		0		0		0		0		
	Scirtidae	SC	4		0		0		0		0		0
	Staphylinidae	PR	0		0		0		0		0		0
					0		0		0		0		0
Diptera					0		0		0		0		0
	Athericidae	PR	2		0		0		0		0		0
	Blephariceridae	SC	0		0		0		0		0		0
	Ceratopogonidae	PR	9		0	1	9		0	1	9		0
	Chaoboridae	PR	7		0		0		0		0		0
	Chironomidae	25	9	14	84	40	240	2	12	11	99	7	42
	Culicidae	FC	∞		0		0		0		0		. 0
	Dixidae	25	-		0		0		0		0		0
	Dolichopodidae	PR	4		0		0		0		0		0
	Empididae	PR	9	7	42	2	12	7	12	2	12		0
	Ephydridae	25	7		0		0		0		0		0
	Muscidae	PR	∞ .		0		0		0		0		0
	Phoridae	PR	9		0		0		0		0		0
	Psychodidae	ည	10		0		0		0		0		0
	Sciomyzidae	PR	10		0		0		0		0		0
	Simuliidae	FC	9		0	45	270	4	24	3	18	11	99
	Stratiomyiidae	25	10		0		0		0		0		0
	Syrphidae	CC	10		0		0		0		0		0
	Tabanidae	PR	9		0		0		0		0		0
	Tanyderidae	OC C	-		0		0		0		0		0
	Lipulidae	SH	3	1	æ	1	3	1	3	17	51	23	69

Ephrencoptera	Parenterlate	Particular CC Control	Pareticular	Order	Family	FFG	Tolerance Value	SFP2	HBI	SFP1	HBI	GF1	HBI	SC1	HBI	RCI	Æ
Ameleiidae GC 1	Americal continue CC CC CC Americal continue CC CC CC CC Americal continue CC CC CC CC CC CC CC	Proceedings	Ameleidate	Enhemerontera					0		0		0		0		0
Besticute	Beatricidae GG 4 1 1 1 1 1 1 1 1 1	Besticide CC 4 1 1 1 1 1 1 1 1 1	Bearlicide	paremet opter a	Ameletidae	CC	1		0 0		0 0		0 0		0 0		0
Pacticipate Control of the Contr	Beneticitate GC 4 1 1 1 1 1 1 1 1 1	Protection	Contaction Color Color		Baetidae	25	. 4		> <		o c		0 0		0 (0
Properties Continue Continu	Carefulder CGC 4	Considered Continue Continu	Ephramerilidate GC 4 4 4 4 4 4 4 4 4		Baetiscidae	29	ေစ		0 0		0 0		o c		0 0		0 0
Explanementification CCC 4 1 1 1 1 1 1 1 1 1	Pleanenelidide CCC 4 1 2 2 2 2 2 2 2 2 2	Promoticities CCC 4 1 1 1 1 1 1 1 1 1	Ephemeric Hilder GC		Caenidae	OC	4		0		o C		0 0		0 0		0 0
Higheneridae	Experiencial	Figure F	Helyategranidate GC 4 1 1 1 1 1 1 1 1 1		Ephemerellidae	OC	4		0		0		o c	,	0 5		0 0
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Aeshnidae PR 3 0	Aeshnidae PR 3 0	Aeshnidae PR 3 0	Aeshnidae PR 3 0 0 Calopterygidae PR 5 0 0 Coenagrionidae PR 9 0 0 Cordulidae PR 3 0 0 Comphidae PR 1 0 0 Lestidae PR 9 0 0						o c		0 0		> 0		o 0		0
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PR 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PR 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PR 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PR 5 0 0 0 PR 1 1 0 0 0 PR 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Cordalometrido	L L			0		0		0		0		0
PR 5 0 0 0 PR 1 0 0 0 PR 9 0 0 0	PR 5 0 0 0 0 0 0 PR 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PR 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PR 5 0 0 0 PR 1 PR 9 0 0 0		Cordulegasundae	P.K	0		0		0		0		0		0
PR 1 0 0 0 0 PR 9 0 0 0 0	PR 1 0 0 0 0 PR 9 0 0 0	PR 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PR 1 0 0 0 PR 9 0 0		Cordulidae	PR	5		0		0		0		0		0
PR 9 0 0 0 0	PR 9 0 0 0 0	PR 9 0 0 0 0 0	PR 9 0 0		Gomphidae	PR	T		0		0		0		0		C
					Lestidae	PR	6		0		0		C				0 0
)		0		>

Order	Family	FFG	Tolerance Value	SFP2	HBI	SFP1	HBI	GF1	HBI	SC1	HBI	RC1	HBI
					0		0		0		0		c
Plecoptera					0		0		0		0 0		o c
	Capniidae	SH	Ħ		0		c				, ,		
	Capniidae/Leuctridae	SH	0.5		0		o c		0 0		o c		o c
	Chloroperlidae	PR	1		0		0		0 0		0 0		o c
	Leuctridae	HS	0	4	0		0	47	0	00	0 0	٣	o c
	Nemouridae	SH	7		0		0		C)	o c
	Peltoperlidae	SH	2		0		0		0		0 0		0 0
	Perlidae	PR	-		0		0	2	2		0		· c
	Perlodidae	PR	2		0		0		0		0		0
	Pteronarcyidae	SH	0		0		0		0		0		0
	Taeniopterygidae	SH	2		0		0		0		0		0
					0		0		0		0		0
I richoptera		4	*		0		0		0		0		0
	Brachycentridae	EC.			0		0		0		0		0
	Calamoceratidae	SH	2		0		0		0		0		0
	Glossosomatidae	SC	0		0		0		0		0		0
	Helicopsychidae	SH	n		0		0		0		0		0
	Hydropsychidae	FC	9	65	390	13	78	44	264	32	192	52	312
	Hydroptilidae	SC	9		0		0		0		0		0
	Lepidostomatidae	SH	-		0		0		0		0		0
	Leptoceridae	ည္	4		0		0		0		0		0
	Limnephilidae	SH	4		0		0		0		0		0
	Odontoceridae	SC	0		0		0		0		0		0
	Philopotamidae	25	3		0		0		0	m	6	1	"
	Phryganeidae	SH	4		0		0		0		0	•	
	Polycentropodidae	FC	9		0		0		0		0) c
	Psychomyiidae	CC	2		0		0		0		0		o C
	Rhyacophiloidea	PR	0		0		0		0				o c
	Talitridae		80		0		0		0		0		o c
	Uenoidae	SC	3		0		0		0		0		· c
											,		>

HB	0	0	0	0	0	0	0	0	C	, rv	0	0	0	0	C	0	0	· c	0	0	0	0	0	0	0	0	0	0	0		72
RC1										1																					102
異	0	0	0	0	0	0	40	0	0	20	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0		4.882353
SCI							2			4												2									102 4
HBI	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0		3.354545
GF1										8												4									110
HBI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	26	0	7	0	0	0		6.266667
SFP1																						10		7		1					120
HBI	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	88	0	0	0	0	0	0	0		5.914286
SFP2										1												11									105
Tolerance Value			9	9			∞	co.	S	5	9	o o	œ	9	7	7	3	S	∞	5	9	∞	∞	00	∞	7	4	•	4	HBI SCORE	
FFG			25	SC	25		90	PR	CC	SH	25	FC	SH	ည	SC	PR	SC		gc	PA	PR	25	FC	SC	OM	SC	SC	E E	PR	FFG	2
Family			Amphipoda	Ancylidae	Annelida	Arachnida	Asellidae	Atractideidae	Branchiobdellidae	Cambaridae	Collembola	Corbiculidae	Decapoda	Gammaridae	Gastropoda	Hirudinidae	Hydrobiidae	Hydracarina	Isopoda	Nematoda	Nemerterea	Oligochaeta	Pelecypoda	Fhysidae	Planariidae	Planorbidae	Pleuroceridae	Sphaeriidae	Turbellaria		
Order		Otner Laxa																													

Station	
SFP2	

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
	65.00	0 1.00	14.00	00:69		105.00	2.00

% Ephemeroptera		% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG#	HBI (Family)
	000	70.0						
	0.00	3.81	0.95	5 13.33	79.00	75.24	4	5.91

SFP2

VASCI Metrics (Truncated)	40.91	18.18	0.00	10.70	1.85	86.67	35.78	60.15	
VASCI Metrics vs. Standard VASCI Metrics (Truncated)	40.91	18.18	0.00	10.70	1.85	86.67	35.78	60.15	
	Number of Taxa	Number of EPT Taxa	Percent E	Percent PT Less Hydropsychidae	Percent Scrapers	Percent Chironomidae	Percent Two Dominant	Hilsenhoff Biotic Index	

Raw VASCI	Final VASCI	
	31 78	21 70
	07:40	07.70

on :

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa EPT Taxa	PT Taxa
	13.00	00	8.00 40.00	13.00	120.00	00.6	1.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG#	HBI (Family)
				The state of the s	The second secon		
0.0	0.00	6.67	33.33	85.00	7		6 27
					0000		7

SFP1

	40.91	60.6	0.00	0.00	12.92	66.67	42.15	54 05
VASCI Metrics (Truncated	40				1	9	4	ŭ
VASCI Metrics vs. Standard VASCI Metrics (Truncated)	40.91	60.6	0.00	0.00	12.92	66.67	42.15	54.85
	Number of Taxa	Number of EPT Taxa	Percent E	Percent PT Less Hydropsychidae	Percent Scrapers	Percent Chironomidae	Percent Two Dominant	Hilsenhoff Biotic Index

Raw VASCI	Final VASCI
	28.32 28.32

Total Hydropsychidae	Total E	phemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	Total Taxa FPT Taxa
				The state of the s	THE RESIDENCE OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN C		י סבמו ומעם	DVD I
	32.00	10.00	10.00	11.00	43.00		100 00 11 00 501	00
		THE RESERVE THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN	STATE OF THE PERSON NAMED IN COLUMN NAMED IN C		2000		00:41	

% Ephemeroptera	% PT less	s Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
			THE RESERVE THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.		THE REAL PROPERTY AND ADDRESS OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS N	2000		(i allily)
	9.80	10.78	01	9.80	0.78	48.04		V 80
		The second name of the second na			20121			00.7

CC1

ASCI Metrics (Truncated)	63.64	45.45	15.99	30.29	19.00	89.22	75.09	75.29
VASCI Metrics vs. Standard VASCI Metrics (Truncated)	63.64	45.45	15.99	30.29	19.00	89.22	75.09	75.29
	Number of Taxa	Number of EPT Taxa	Percent E	Percent PT Less Hydropsychidae	Percent Scrapers	Percent Chironomidae	Percent Two Dominant	Hilsenhoff Biotic Index

aw VASCI	Final VASCI	
	51.75	51.75

Station		
RC1		

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa EPT Taxa
	52.00	0.00	7.00	26.00	102:00	3.00

% Ephemeroptera		% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa FFG #	HBI (Family)
				The second secon		The same of the sa	14
	0.00	3.92	0.00	0 6.86	75.00	73 53	5 00
							20.5

RC1

Raw VASCI	Final VASCI	
	36.65	32.26

|--|

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa EPT Taxa	Taxa
	44.00	0.00	2.00	93.00	110.00	10.00	3.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa FFG #	FFG #	HBI (Family)
	0.00	0.00	0 1.82	91.00	82.73		3.35

GF1

	VASCI Metrics vs. Standard VASCI Metrics (Truncated)	VASCI Metrics (Truncated)
Number of Taxa	45.45	5 45.45
Number of EPT Taxa	77.72	7 27.27
Percent E	0.00	0.00
Percent PT Less Hydropsychidae	125.13	3 100.00
Percent Scrapers	0.00	0.00
Percent Chironomidae	98.18	3 98.18
Percent Two Dominant	24.96	5 24.96
Hilsenhoff Biotic Index	97.79	97.79

49.21		52.35	
	Final VASCI		Raw VASCI